

# National Advisory Committee for Aeronautics

## Research Abstracts

NO. 83

MAY 25, 1955

### CURRENT NACA REPORTS

NACA Rept. 1173

ON TRAVELING WAVES IN BEAMS. Robert W. Leonard and Bernard Budiansky. 1954. iii, 27p. diags. (NACA Rept. 1173. Formerly TN 2874)

The basic equations of Timoshenko for the motion of vibrating nonuniform beams, which allow for effects of transverse shear deformation and rotary inertia, are presented in several forms; the propagation of sharp disturbances is discussed. Numerical traveling-wave solutions are obtained for some elementary problems of finite uniform beams for which the propagation velocities of shear and bending discontinuities are equal. Comparisons are made with modal solutions and, in some cases, with exact closed solutions.

NACA Rept. 1177

COMPARISON OF PERFORMANCE OF EXPERIMENTAL AND CONVENTIONAL CAGE DESIGNS AND MATERIALS FOR 75-MILLIMETER-BORE CYLINDRICAL ROLLER BEARINGS AT HIGH SPEEDS. William J. Anderson, E. Fred Macks and Zoltan N. Nemeth. 1954. ii, 15p. diags., 6 tabs. (NACA Rept. 1177. Formerly TN 3001; TN 3002)

Studies are reported of four experimental bearings with outer-race-riding cages and inner-race-guided rollers operated at lower temperatures and to higher DN values (product of bearing bore in mm and shaft speed in rpm) than conventional inner- and outer-race-riding cage-type bearings. The experimental cages were designed to allow maximum cooling with minimum oil entrapment. In an investigation of four outer-race-riding cage-type bearings (two with bronze and two with nodular iron cages), heavy wear was found to accompany cage slip. Cage slip and, consequently, wear were found higher with nodular iron than with bronze at high speeds.

NACA Rept. 1185

THE CALCULATION OF PRESSURE ON SLENDER AIRPLANES IN SUBSONIC AND SUPERSONIC FLOW. Max. A. Heaslet and Harvard Lomax. 1954. ii, 11p. diags. (NACA Rept. 1185. Formerly TN 2900)

Under the assumption that a wing, body, or wing-body combination is slender or flying at near sonic velocity, expressions are given which permit the calculation of pressure in the immediate vicinity of the configuration. The disturbance field, in both subsonic and supersonic flight, is shown to consist of two-dimensional disturbance fields extending laterally and a longitudinal field that depends on the streamwise growth of cross-sectional area. A discussion is also given of couplings, between lifting

and thickness effects, that necessarily arise as a result of the quadratic dependence of pressure on the induced velocity components.

NACA Rept. 1186

FORMATION AND COMBUSTION OF SMOKE IN LAMINAR FLAMES. Rose L. Schalla, Thomas P. Clark and Glen E. McDonald. 1954. ii, 21p. diags., photos. (NACA Rept. 1186. Formerly RM E51E15; RM E52G24; RM E52I22; RM E52I26; RM E53E05; RM E53J12; RM E54E03)

The nature and formation of smoke and its combustion were investigated. Factors affecting smoke formation were studied in both diffusion flames and premixed Bunsen flames. The variables investigated were (1) fuel type, (2) external air-flow rate, (3) oxygen-enrichment of external air, (4) substitution of argon for nitrogen in external oxidant, (5) fuel temperature or primary mixture temperature, and (6) pressure. The ability of a flame to burn smoke admitted from an exterior source was also studied. A critical survey was made of the literature pertaining to the mechanism of smoke formation.

NACA TN 3295

EFFECT OF PRESSURE ON THERMAL CONDUCTANCE OF CONTACT JOINTS. Martin E. Barzelay, Kin Nee Tong and George F. Holloway, Syracuse University. May 1955. 52p. diags., 2 tabs. (NACA TN 3295)

As an extension of previous experimental work further tests were conducted to determine the factors influencing the thermal conductance across the interface formed between stationary plane surfaces of 75S-T6 aluminum alloy and AISI Type 416 stainless-steel blocks. The types of joints investigated included bare metal-to-metal contact, contact surfaces separated by a good conductor (brass shim stock), and contact surfaces separated by a thin sheet of insulation (asbestos).

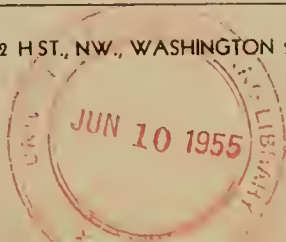
NACA TN 3297

EFFECT OF OXYGEN CONTENT OF FURNACE ATMOSPHERE ON ADHERENCE OF VITREOUS COATINGS TO IRON. A. G. Eubanks and D. G. Moore, National Bureau of Standards. May 1955. 17p. diags., photos., 2 tabs. (NACA TN 3297)

A series of vitreous coatings of the same basic composition, but with cobalt-oxide contents varying from 0 to 6.4 percent by weight, was fired on ingot iron in atmospheres consisting of various oxygen-nitrogen mixtures. The effect of the oxygen content of the atmosphere on adherence was determined by sub-

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jecting each specimen to the American Society for Testing Materials adherence test, and the effect on interface roughness was estimated from examination of metallographic sections.

#### NACA TN 3381

**HEAT-LOSS CHARACTERISTICS OF HOT-WIRE ANEMOMETERS AT VARIOUS DENSITIES IN TRANSONIC AND SUPERSONIC FLOW.** W. G. Spangenberg, National Bureau of Standards. May 1955. 82p. diagrs., photos., 14 tabs. (NACA TN 3381)

An experimental investigation was made of the heat-loss characteristics of heated fine wires suitable for use as anemometers in turbulence research. Speeds ranged from low subsonic to Mach number 1.9. Density and temperature loading were varied over wide limits, and wire diameters ranged from 0.00005 to 0.0015 inch. The effects of each of the several variables on the heat-loss characteristics of both normally oriented and swept wires were measured.

#### NACA TN 3385

**THEORY OF THE JET SYPHON.** B. Szczeniowski, University of Montreal. May 1955. 49p. diagrs., 3 tabs. (NACA TN 3385)

A new approach to the theory of the mixing of two currents in an injector is presented, dealing with an incompressible ideal fluid. The theory shows new potentialities in an appropriate shaping of the form of the walls of the mixing zone so as to improve the jet-syphon efficiency beyond that heretofore predicted theoretically. Some examples of ways to improve jet-syphon efficiency are indicated.

#### NACA TN 3418

**THE ZERO-LIFT WAVE DRAG OF A PARTICULAR FAMILY OF UNSWEPT, TAPERED WINGS WITH LINEARLY VARYING THICKNESS RATIO.** Arthur Henderson, Jr. and Julia M. Goodwin. May 1955. 28p. diagrs. (NACA TN 3418)

On the basis of linear theory, the zero-lift wave drag of a particular family of unswept, tapered wings with linearly varying thickness ratio and symmetrical parabolic-arc sections has been calculated. By comparing the drag for these wings with that for a corresponding constant-thickness-ratio wing with rhombic sections, it is found that the variable-thickness-ratio wings can be used to advantage with no serious structural penalties if the wings are assumed to have the same given root thickness ratio or the same internal volume.

#### NACA TN 3436

**AN INVESTIGATION OF SEVERAL NACA 1-SERIES NOSE INLETS WITH AND WITHOUT PROTRUDING CENTRAL BODIES AT HIGH-SUBSONIC MACH NUMBERS AND AT A MACH NUMBER OF 1.2.** Robert E. Pendley and Harold L. Robinson. May 1955. 51p. diagrs., photos. (NACA TN 3436. Formerly RM L9L23a)

Measurements of pressure distribution, drag, and internal-flow pressure loss are presented for three NACA 1-series nose inlets, two of which were fitted with protruded central bodies. Test Mach number and inlet-velocity ratio ranged from 0.4 to 1.2 and from 0 to 1.34, respectively. The nose-inlet pressure drag at a Mach number of 1.2 and the central-body effects on subcritical drag, the supercritical drag rise, and the inlet total-pressure loss are discussed.

#### NACA TN 3450

**PRELIMINARY INVESTIGATION OF PROPERTIES OF HIGH-TEMPERATURE BRAZED JOINTS PROCESSED IN VACUUM OR IN MOLTEN SALT.** C. A. Gyorgak and A. C. Francisco. May 1955. 29p. diagrs., photos., 7 tabs. (NACA TN 3450)

An investigation was conducted to determine the effect of the variables temperature, time at temperature, and nickel addition to the braze alloy on the shear strength of high-temperature-alloy brazed joints processed in vacuum or in molten salt. Both brazing methods produced shear strengths greater than those of joints processed in dry hydrogen. Vacuum brazing was superior to salt-bath brazing, average shear strengths being on the order of 63,000 and 48,000 psi, respectively.

#### NACA TN 3451

**ANALYSIS OF FULLY DEVELOPED TURBULENT HEAT TRANSFER AND FLOW IN AN ANNULUS WITH VARIOUS ECCENTRICITIES.** Robert G. Deissler and Maynard F. Taylor. May 1955. 42p. diagrs. (NACA TN 3451)

A previous analysis for turbulent heat transfer and flow in tubes was generalized and applied to an annulus with various eccentricities. Expressions for eddy diffusivity which were varied for flow and heat transfer in tubes were assumed to apply in general along lines normal to a wall. Velocity distributions, wall shear-stress distributions, and friction factors, as well as wall heat-transfer distributions, wall temperature distributions, and average heat-transfer coefficients, were calculated for an annulus having a radius ratio of 3.5 at various eccentricities.

#### NACA TN 3452

**INVESTIGATION OF JET-ENGINE NOISE REDUCTION BY SCREENS LOCATED TRANSVERSELY ACROSS THE JET.** Edmund E. Callaghan and Willard D. Coles. May 1955. 27p. diagrs., photos., tab. (NACA TN 3452)

An investigation of screens located transversely across a jet as a noise-reduction device was conducted on a full-scale turbojet engine. The screens lowered the sound pressure levels rearward and increased them in front resulting in a nearly circular, nondirectional sound field. The sound power level was lowered by as much as 7.5 db by the proper screen choice and location, and, in addition, the maximum sound pressure level was decreased approximately 12 db over that of the engine alone.



NACA TN 3453

LONGITUDINAL TURBULENT SPECTRUM SURVEY OF BOUNDARY LAYERS IN ADVERSE PRESSURE GRADIENTS. Virgil A. Sandborn and Raymond J. Slogar. May 1955. 40p. diags., tab. (NACA TN 3453)

Results of measurements of the longitudinal velocity-component spectra at various positions through the boundary layer for four stations in increasing adverse pressure gradients are presented in tabular form. A comparison is presented between longitudinal turbulence spectra in zero pressure gradient and in moderate adverse pressure gradients (reasonably far from separation). The effect of pressure gradient was found to be small. The measured spectra are also compared with the predicted variations derived from the hypothesis of statistical equilibrium. Longitudinal-turbulence scales and microscales evaluated from spectrum measurements are given.

## BRITISH REPORTS

N-36607\*

Royal Aircraft Establishment (Gt. Brit.)  
A STUDY OF THE LONGITUDINAL RESPONSE OF AIRCRAFT TO TURBULENT AIR. J. K. Zbrozek. January 1955. 31p. diags., tab. (RAE Aero 2530)

A method of calculating the aircraft dynamic behavior in turbulent air is presented. It is suggested that the assessment of the aircraft dynamic stability should include the study of aircraft behavior in turbulent air in addition to the present practice of evaluating the dynamic characteristics for perfectly smooth conditions. The dynamic behavior of aircraft in continuous turbulence is examined theoretically, investigating the influence of the following parameters: static margin (changing c. g. position), damping in pitch, lift slope, wing loading, and aircraft size. The theory outlined in the present paper provides the information required in gunnery and bombing problems and should be useful in the studies of automatic stabilization and gun- and bomb-sight design. Some results regarding gust loads in continuous turbulence are also obtained, which may have application in studies of the fatigue life of aircraft structures.

N-36608\*

Royal Aircraft Establishment (Gt. Brit.)  
TROPICAL EXPOSURE TESTS ON WOOD ASSEMBLY ADHESIVES AT T. T. E., NIGERIA. A. Baker and M. G. D. Hockney. January 1955. 11p. 3 tabs. (RAE Tech. Note Chem. 1244)

Tropical trials of assembly adhesives by the boxed test-piece technique have been proceeding for 3 years. Specimens have been withdrawn for strength testing, in comparison with temperate controls, at suitable periods. The results are discussed in the light of contemporary F. P. R. L. sponsored trials of plywood and wood assembly adhesives.

N-36609\*

Nat. Gas Turbine Establishment (Gt. Brit.)  
CALCULATED WEAK LIMIT FLAME TEMPERATURES OF HYDROCARBON-AIR-DILUENT MIXTURES. B. P. Mullins and J. M. Marley. March 1955. 20p. diags., 7 tabs. (NGTE Memo. M. 235)

Weak limit flame temperatures ( $T_L$ ) have been calculated for hydrocarbon-air-diluent systems using the known experimental values of the ternary compositions at the weak limit of inflammability. The effectiveness of five gaseous diluents in causing  $T_L$  to increase lies in the ascending order: argon, nitrogen, water vapor, carbon dioxide, and carbon tetrachloride.

N-36611\*

Royal Aircraft Establishment (Gt. Brit.)  
THE LOAD DISTRIBUTION AT SONIC SPEED OVER A FAMILY OF LINEARLY TWISTED WINGS WITH STRAIGHT-EDGED PLANFORMS. D. G. Randall. January 1955. 42p. diags., 3 tabs. (RAE Aero 2531)

The method for the calculation of the load distribution over a wing at sonic speed described by K. W. Mangler, which is based on linearized potential flow, is applied to a family of linearly twisted wings with straight-edged plan forms. The results obtained are plotted against the following three parameters: A the aspect ratio,  $1 - \lambda/1 + \lambda$ , where  $\lambda$  is the taper ratio, and  $A \tan \Delta 1/2$ , where  $\Delta 1/2$  is the sweepback angle of the half-chord line. The results obtained in previous work for the same family of plan forms at incidence are plotted against the same parameters. In addition a particular wing is studied in detail; chordwise pressure distributions, spanwise loading, etc. are presented for the plane wing at incidence and the twisted wing at zero incidence.

N-36616\*

Aeronautical Research Council (Gt. Brit.)  
THE INTERACTION BETWEEN SHOCK WAVES AND BOUNDARY LAYERS. D. W. Holder, H. H. P. Pearcey and G. E. Gadd. WITH A NOTE ON THE EFFECTS OF THE INTERACTION ON THE PERFORMANCE OF SUPERSONIC INTAKES. J. Seddon. 1955. 101p. diags., photos., 2 tabs. (ARC CP 180)

The interaction between shock waves and boundary layers has important effects in many problems of high-speed flow. This paper has been written as a guide to the literature on the subject, and as a critical review of the present state of knowledge concerning both the underlying physical processes and the practical applications. Part I of the paper describes experiments on comparatively simple types of flow designed to provide fundamental information and to assist in the development of the theory. Many of the features found in the fundamental experiments appear also in practical applications and these are considered in Parts II and III. Some notes on the further work that is required are given in Part IV.

N-36617\*

Aeronautical Research Council (Gt. Brit.)  
REPORT OF THE DEFINITIONS PANEL ON THE  
DEFINITIONS OF THE THRUST OF A JET ENGINE  
AND OF THE INTERNAL DRAG OF A DUCTED  
BODY. 1955. 28p. diags. (ARC CP 190)

The problems which occur in defining the thrust of a jet engine and the internal drag of a ducted body are considered, and format definitions and names are given for the concepts considered to be of importance.

N-36618\*

Aeronautical Research Council (Gt. Brit.)  
SHADOWGRAPHS OF MODEL PROJECTILES FIRED  
AT HIGH MACH NUMBERS AND NEAR  $M = 1$  IN THE  
N.P.L. BALLISTIC RANGE. W. F. Cope. 1955.  
49p. diags., photos. (ARC CP 189)

Shadowgraphs of 20 mm projectiles fired at Mach numbers above 3 are shown and the important features are discussed. Shadowgraphs of three rounds which passed through  $M = 1$  are also shown. In all three cases the drag coefficient was determined, and for one, all of the aerodynamic coefficients were found. The effect of the retardation is discussed and it is concluded that the effect is probably small enough to be negligible except perhaps on the drag. These rounds were stable. The unstable region for a projectile is at a lower Mach number (about 0.75). To illustrate this, the analysis of some earlier rounds is included.

N-36619\*

Aeronautical Research Council (Gt. Brit.)  
NOTE ON THE FLOW NEAR THE TAIL OF A TWO-  
DIMENSIONAL AEROFOIL MOVING AT A FREE-  
STREAM MACH NUMBER CLOSE TO UNITY. D. W.  
Holder. 1955. 11p. diags., photos. (ARC CP 188)

A qualitative argument, which is supported by experimental evidence, suggests that the local Mach number downstream of the trailing-edge shock waves is approximately independent of free-stream Mach number, airfoil geometry, and angle of attack. Thus, there is a unique relationship between the flow deflection angle at the trailing edge and the local Mach number just upstream of the trailing-edge shock waves. This relationship is determined from wind-tunnel experiments on RAE series airfoils and may be used to give rapid estimates of the local Mach number at the trailing-edge of an airfoil in terms of the trailing-edge angle, angle of attack, and control angle. The characteristics of straight-sided controls are considered for an example.

N-36621\*

Aeronautical Research Council (Gt. Brit.)  
INTEGRATION OF THE BOUNDARY LAYER EQUA-  
TIONS FOR A PLANE IN COMPRESSIBLE FLOW BY  
THE METHOD OF STEEPEST DESCENT. D.  
Meksyn. July 31, 1954. 11p. tab. (ARC 16,961;  
FM 2098)

In a former paper the author found the asymptotic integrals of the equations of motion for the flow past a semi-infinite plane for supersonic speed, for the case when the coefficients of viscosity and conductivity depend on or are independent of temperature, and has shown that the results obtained are in close agreement with those found by numerical integration. The integration was carried out for the case of no heat transfer and for a particular value of Prandtl number  $\sigma = 0.733$ . The aim of the present paper is to extend the integration of the equations to the general case of heat transfer and arbitrary  $\sigma$  (close to unity).

N-36622\*

Aeronautical Research Council (Gt. Brit.)  
SURFACE NOISE FROM A PLANE TURBULENT  
BOUNDARY LAYER. O. M. Phillips. August 4,  
1954. 15p. diagr. (ARC 16,963; FM 2099)

A study is made of the properties of the viscous sub-layer in a turbulent flow past a solid boundary, from which the surface noise produced by the distribution of fluctuating stresses on a plane boundary can be estimated. The intensity of the surface noise per unit area is compared with the expression given by Lighthill for the aerodynamic quadrupole noise of a turbulent boundary layer. It appears that for Mach numbers less than about unity, the dipole radiation from the surface is more efficient than the quadrupole radiation from the turbulent boundary layer itself.

N-36625\*

Aeronautical Research Council (Gt. Brit.)  
THE DISTRIBUTION OF PRESSURE ON AN AERO-  
FOIL, IN A STREAM WITH A SPANWISE VELOCITY  
GRADIENT. W. A. Mair. July 13, 1954. 16p.  
diags., 3 tabs. (ARC 16,937; FM 2093)

Pressure measurements were made at one section of an airfoil of constant chord spanning a wind tunnel. A flat plate was mounted in the tunnel upstream of the airfoil so that the wake from the plate produced a spanwise velocity gradient at the airfoil. By traversing the plate across the tunnel, the position of the wake could be altered relative to the pressure holes in the airfoil so that the complete pressure distribution over the airfoil in the neighborhood of the wake could be found. The results showed that, because of the secondary flow produced by the interaction between the airfoil and the wake, the variation of the pressure across the wake for a given chordwise position was very small, except close to the leading edge. The lift coefficient was nearly constant across the wake. The form drag coefficient was considerably reduced in the wake.

N-36626\*

Aeronautical Research Council (Gt. Brit.)  
ON THE EFFECT OF WING BENDING ON THE  
ACCELERATION DUE TO LANDING IMPACT. A. R.  
Collar. June 1954. 6p. diags. (ARC 16,960;  
S. 729)

Some previously recorded measurements of the normal accelerations due to landing of a seaplane at varying vertical velocities are compared with accelerations theoretically predicted. While good



agreement is obtained on the magnitude of the peak acceleration, this peak occurs in all cases about twice as long after impact as is predicted by theory. Various explanations have been considered, including that of wing bending; however, this had been discarded. The present author believes that the flexibility of the structure might cushion the impact. Since all the vertical momentum must be destroyed, whether the wings are flexible or not, it is to be expected that the peak acceleration will be about the same, but it will occur later if the wings flex than if they are rigid. A simple mathematical model is discussed.

N-36638\*

Ministry of Supply (Gt. Brit.)  
EXPERIENCE OF FATIGUE AT WEYBRIDGE.  
Part 2: - AN INVESTIGATION INTO THE FATIGUE STRENGTH OF ALUMINIUM ALLOY TO SPECIFICATION. D. T. D. 364. (Part 2 of final report prepared by Vickers-Armstrong, Ltd., Weybridge) March 1955. iii, 31p. diags., 15 tabs. (Ministry of Supply. S & TM 2/55)

This report presents the results of a series of direct stress fatigue tests on aluminum alloy D. T. D. 364 (2014). The work described in this report shows clearly the difficulty of establishing for a given material allowable fatigue stresses on simple specimens. It is considered that much more work is necessary on other light alloy specifications, and that more work should be undertaken to establish precisely the calibration of fatigue testing machines.

N-36639\*

Royal Aircraft Establishment (Gt. Brit.)  
SOME PROPELLER NOISE CALCULATIONS SHOWING THE EFFECT OF THICKNESS AND PLANFORM. K. V. Diprose. January 1955. 16p. diags., 4 tabs. (RAE Tech. Note MS 19)

Sound pressures have been calculated for a propeller designed for a high-speed airplane (Mach 0.77). The contribution to the noise due to the blade thickness was much larger than expected; reasons are given for doubting the validity of the formulas used, and ways of improving them suggested. Tapering the plan form, to move the main sources of noise further inboard to regions of lower Mach number was found to produce only small relief in the calculated noise.

N-36641\*

Royal Aircraft Establishment (Gt. Brit.)  
WIND TUNNEL OBSERVATIONS OF BOUNDARY LAYER TRANSITION ON TWO SWEEPBACK WINGS AT A MACH NUMBER OF 1.61. J. B. Scott-Wilson and D. S. Capps. December 1954. 12p. diags., photos. (RAE Tech. Note Aero 2347)

Visual observations of transition were made on two sweptback wings at a Mach number of 1.61. Laminar boundary-layer instability which resulted in the formation of streamwise vortices, was found on these wings. At zero incidence the Reynolds number, based on the mean chord of the wing, at which this instability occurred,  $1.9 \times 10^6$ , was very much lower than the critical value predicted by low-speed theory. At incidence the laminar boundary layer on

the wing was found to be more stable on the upper surface, but less stable on the lower surface than at zero incidence.

N-36642\*

Royal Aircraft Establishment (Gt. Brit.)  
THE MECHANISM OF FATIGUE FAILURE IN SOME BINARY AND TERNARY ALUMINIUM ALLOYS. P. J. E. Forsyth and C. A. Stubbington. December 1954. 27p. diags., photos., tab. (RAE Met. 81)

The fatigue process in a number of aluminum alloys was found to be one of depletion of solute atoms in localized regions under the action of cyclic stresses. This depletion or overageing provided soft spots in the structure in which most of the subsequent plastic deformation was concentrated. Depending on temperature, these depleted zones were trans or inter-crystalline, and the subsequent fatigue crack followed these paths. A crack once started, might, by virtue of the heavy stress concentration, produce its own depleted zone ahead of the root, and could thus progress without particular reference to existing soft spots.

## MISCELLANEOUS

NACA TN 3152

Errata on "TRANSVERSE OSCILLATIONS IN A CYLINDRICAL COMBUSTION CHAMBER." Franklin K. Moore and Stephen H. Maslen. October 1954.

N-37041

Advisory Group for Aeronautical Research and Development. PROCEEDINGS OF THE THIRD AGARD GENERAL ASSEMBLY, SEPTEMBER 7 AND 10, 1953: ROLE OF RESEARCH AND DEVELOPMENT IN AVIATION DURING THE LAST TEN YEARS. Harry Garner, Ministry of Supply. SOME TASKS FOR AGARD. O. H. Wansbrough-Jones, Ministry of Supply. THE REVIEW OF ICING RESEARCH. (Problemes poses par le givrage des avions). Edmond A. Brun, National Council of Scientific Research. THOUGHTS ON FUTURE NOISE SUPPRESSION RESEARCH. E. J. Richards, University of Southampton. THE STRUCTURAL EFFECTS OF AERODYNAMIC HEATING. N. J. Hoff, Polytechnic Institute of Brooklyn; APPENDIX I: THERMAL CONDITIONS ASSOCIATED WITH AIRCRAFT IN FLIGHT. Martin Bloom, Polytechnic Institute of Brooklyn; APPENDIX II: SIMULATION OF AERODYNAMIC HEATING IN STRUCTURAL TESTING. Joseph Kempner, Polytechnic Institute of Brooklyn. FOUNDATIONS OF OPERATIONAL RESEARCH. Theodore von Karman. OPERATIONAL RESEARCH. B. G. Dickins, Air Ministry. AEROMEDICAL INTERESTS - LOOKING FORWARD. Otis O. Benson, Jr., USAF. EXAMPLES OF NATO

N-37041

## EXCHANGE OF SCIENTIFIC PERSONNEL.

M. Brull, University of Michigan. A TOUR OF WESTERN EUROPE: APRIL, 1953. Edited by L. H. G. Sterne. (Presented at London AGARD Conference, September 3-11, 1953). 115p. diags., photos. (Advisory Group for Aeronautical Research and Development. AG6/P3)

N-37086\*

Advisory Group for Aeronautical Research and Development. SPONTANEOUS IGNITION OF LIQUID FUELS. B. P. Mullins. 1955. xi, 117p. diags. (AGARDograph 4)

This book is a survey and review of the present status of knowledge in that area of the combustion field concerned with spontaneous ignition. The test methods used to obtain spontaneous ignition temperature are described in detail and spontaneous ignition temperature data are presented for 433 substances. Additional information is given on general theoretical considerations, fuel additives, and applications of spontaneous ignition data.

(May be purchased from Butterworth's Publications, Ltd., 88 Kingsway, London, W. C. 2, England at \$2.75.)

N-37087\*

Advisory Group for Aeronautical Research and Development. ANTHROPOMETRY AND HUMAN ENGINEERING: BODY MEASUREMENTS IN RELATION TO WORK SPACES IN AIRCRAFT. G. M. Morant. STATISTICS OF ELEMENTARY MEDICAL BIOMETRY RELATIVE TO PILOTS OF THE FRENCH AIR FORCE. (STATISTIQUES DE BIOMETRIE MEDICALE ELEMENTAIRE RELATIVES AU PERSONNEL NAVIGANT DE L'ARMEE DE L'AIR FRANCAISE). E. Ducros. SHELDON TYPES AND SUCCESS IN FLIGHT PERFORMANCE. Johns. Dossing. ADAPTING THE AEROPLANE TO THE PILOT. W. K. Stewart. INSTRUMENT DIALS, INSTRUMENT ARRANGEMENT AND COCKPIT DESIGN. Walter F. Grether. A METHODOLOGY FOR INSTRUMENT DISPLAY DESIGN. George W. Hoover. FACTORS AFFECTING THE VALIDITY AND UTILITY OF AEROMEDICAL RESEARCH DATA. Robert B. Payne. THE ESTABLISHMENT OF A LONGITUDINAL STUDY OF THE MEDICAL AND PSYCHOLOGICAL ASPECTS OF THE U. S. NAVAL AVIATOR. Ashton Graybiel. SOMATOTYPING. P. M. Van Wulfften Palthe. HUMAN FACTORS IN AIRCRAFT DESIGN. Morley Gray Whillans. (Symposium held May 3-4, 1954, Scheveningen, Netherlands). 1955. 123p. diags., photos., tabs. (AGARDograph 5)

(May be purchased from Butterworth's Publications, Ltd., 88 Kingsway, London, W. C. 2, England at \$3.00.)

## DECLASSIFIED NACA REPORTS

NACA RM A51E16

A FLIGHT STUDY OF REQUIREMENTS FOR SATISFACTORY LATERAL OSCILLATORY CHARACTERISTICS OF FIGHTER AIRCRAFT. Charles J. Liddell, Jr., Brent Y. Creer and Rudolph D. Van Dyke, Jr. July 1951. 39p. diags., photo., 2 tabs. (NACA RM A51E16) (Declassified from Confidential, 5/10/55)

A conventional, propeller-driven fighter, fitted with servo devices for varying in flight the dihedral effect, the static directional stability, and the directional damping was used in a pilot-opinion survey to determine the lateral-oscillatory characteristics which go to make up satisfactory lateral flying qualities. In addition, the lateral aperiodic motions encountered during the investigation and their relations to the pilots' opinions are discussed.

NACA RM E52E16

EXPERIMENTAL INVESTIGATION OF AIR-FLOW UNIFORMITY AND PRESSURE LEVEL ON WIRE CLOTH FOR TRANSPIRATION-COOLING APPLICATIONS. Patrick L. Donoughe and Roy A. McKinnon. July 1952. 28p. diags., photos., tab. (NACA RM E52E16) (Declassified from Confidential, 5/10/55)

An experimental investigation was conducted to obtain information on air-flow uniformity and pressure-level effects for various meshes of stainless-steel corduroy wire cloth, and permeability and strength data for a 20- by 20-mesh stainless-steel wire cloth. It was found that close control of the wire cloth thickness yielded sufficiently uniform air flow and that available methods may be used to predict the effect of pressure level. Permeability and strengths of the 20- by 20-mesh wire cloth were similar to those already available from other meshes. The reduced tensile strength of the 20- by 20-mesh wire cloth in the direction of the primary stresses is one and a half to three times as great as the strength of the best porous sintered materials presently available.

NACA RM L52E07

AN INVESTIGATION OF THE LOW-SPEED LONGITUDINAL STABILITY CHARACTERISTICS OF A SWEEP-WING AIRPLANE MODEL WITH TWO MODIFICATIONS TO THE WING-ROOT PLAN FORM. William B. Kemp, Jr. July 1952. 17p. diags., tab. (NACA RM L52E07) (Declassified from Confidential, 5/10/55)

An investigation has been conducted in the Langley 300-mph 7- by 10-foot tunnel to determine the effects of two wing-root leading-edge plan-form modifications on the low-speed longitudinal stability characteristics of a complete airplane model having a 50.7° sweptback wing.

NACA RM L53E11

EFFECTS OF RATE OF FLAP DEFLECTION ON FLAP HINGE MOMENT AND WING LIFT THROUGH THE MACH NUMBER RANGE FROM 0.32 TO 0.87. Thomas R. Turner. June 1953. 29p. diags., photos. (NACA RM L53E11) (Declassified from Confidential, 5/10/55)

An investigation at Mach numbers from 0.32 to 0.87 has been made to determine the effect of rate of flap deflection on flap hinge moment and wing lift. Rate of flap deflection varied from  $0^{\circ}$  to  $1.17^{\circ}$  per chord length of travel. The Reynolds number varied from approximately  $1.0$  to  $2.3 \times 10^6$ . The wing had an aspect ratio of 4, a taper ratio of 0.6, and zero sweep of the 75-percent-chord line. The wing was fitted with a full-span 25-percent-chord plain flap.

NACA RM L53E15

SOME OBSERVATIONS ON STALL FLUTTER AND BUFFETING. A. Gerald Rainey. June 1953. 11p. diags. (NACA RM L53E15) (Declassified from Confidential, 5/10/55)

An attempt is made to describe the phenomenological differences between stall flutter and buffeting. Some experimental results are presented concerning both the boundaries at which these phenomena occur and the stresses involved.



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